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Patent Application Papers Of:

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For:

ANTI-COUNTERFEIT DETECTION FOR LOW END PRODUCTS

(a) TITLE OF THE INVENTION

Anti-Counterfeit Detection For Low End Products

(b) CROSS-REFERENCES TO RELATED APPLICATIONS

None

(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

(d) BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to anti-counterfeit detection (ACD) of currency or negotiable securities, and more particularly, to such detection as used in inexpensive xerographic copiers and printers for personal computers (PC).

2. DESCRIPTION OF THE RELATED ART INCLUDING INFORMATION DISCLOSED UNDER 37 CFR 1.97 AND 1.98

ACD hardware and software is known from U.S. Pat. 5,533,144, hereby incorporated by reference.

In high-end copiers and printers, the cost of providing a hardware solution for ACD is not a major factor. However, in low-end products, a hardware

addition, e.g., costing $100.00, may double the cost of the device. Similarly, in low-end multifunction, e.g. copier, printer and facsimile, machines which have a scanner, the scanner provides a quick first copy out time by scanning and printing at the same time. In such machines, providing ACD can also be expensive. In particular, in order to accomplish this, internal buffers will have to be maintained which capture the high resolution data to delay printing so that even partial printing is avoided. These size of these buffers will be dictated by the amount of data needed by the ACD algorithms.

It is therefore desirable to have a method and an apparatus for performing ACD that is inexpensive.

(e) BRIEF SUMMARY OF THE INVENTION

A process comprises detecting at first location if a video signal represents a selected type of image; receiving said video signal at a second location separated from said first location, and printing an image from said video signal at said second location if said video signal does not represent said selected type of image.

An apparatus comprises a detector for determining if a video signal represents a selected type of image and a corrector taking corrective action if said video signal represents said selected type of image.

An apparatus disposed at a second location for receiving a video signal from a first location comprises a detector receiving said video signal and determining the presence of a validity code, and a printer printing a reproduction of said video signal only when said validity code is present.

(f) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Fig. 1 is a block diagram of an embodiment of the invention; and
Fig. 2 is a flow chart of the operation of Fig. 1.

(g) DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows an embodiment, wherein a document 100 is disposed on a platen 107 of a flatbed scanner 102, which scanner can be a stand alone one or part of a system, e.g., xerography apparatus. Scanner 102 can also be any other type of imaging device, e.g., a camera having a CCD imager. Scanner 102 provides a video signal to a personal computer (PC) 105, which normally has print driver software (described below) in it. PC 105 is located at a first location. It will be understood that PC 105 need not be a personal one, e.g. it could be a mainframe computer. A printer 108, e.g., a local printer, a network printer, etc., is coupled to PC 105 by transmission means, e.g., cable 109, a radio frequency transmitter (not shown), local area network, etc., in order to receive an analog or digital video signal of any type. This

printer 108 can be an independent printer or be a part of a xerographic or non-xerographic, e.g., ink jet, copier or facsimile (fax) machine. Printer 108 is located at a second location, i.e., it is not in the same enclosure (not shown) as PC 105.

The details of one possible embodiment of printer 106 are substantially the same as shown in U.S. Patent No. 5,991,201. An image processor 114 generates a color image. Digital signals which represent the blue, green and red density signals of the image are converted in the image processing unit into four bitmaps: yellow (Y), cyan (C), magenta (M), and black (K). The bitmap represents the values of the exposure required for each color component of the pixel. Image processor 114 may contain a shading correction unit, an undercolor removal unit (UCR), a masking unit, a dithering unit, a gray level processing unit, and other imaging processing sub-systems known in the art. The image processor 114 can store bitmap information for subsequent images or can operate in a real time mode.

At stage A, toner of a first color is formed on either a belt or drum 116. The photoconductive member is preferably a drum of the type which is typically multilayered and has a substrate, a conductive layer, an optional adhesive layer, an optional hole blocking layer, a charge generating layer and a charge transport layer (none shown). The drum is charged by charging unit 101. Raster output scanner (ROS) 120, controlled by image processor unit 114, writes a first

color image by selectively erasing charges on the drum 116. The ROS 120 writes the image information pixel by pixel. It should be noted that either discharged area development (DAD) can be employed in which discharged portions are developed or charged area development (CAD) can be employed in which the charged portions are developed with toner. After the electrostatic latent image has been recorded, drum 116 advances the electrostatic latent image to development station 103. Dry developer material is supplied by development station 103 to develop the latent image. In the case of CAD development, the charge of the toner particles is opposite in polarity to the charge on the photoconductive surface, thereby attracting toner particles thereto. The latent image is developed with a less than monolayer coverage of toner particles. On the average, the uniformity of the development is such that toner particles are near neighboring toner particles. Development station 103 employs small size toner, preferably having average particles size of about 5 μm.

The developed image is electrostatically transferred to the compliant, low surface energy intermediate member 110 by applying an electrical bias between the drum 116 and intermediate member or belt 110. Any residual toner on the drum 116 is removed with a cleaner 104. Intermediate member 110 may be either a roll or an endless belt with a conductive substrate and a compliant overcoat. The path of the belt is defined by a plurality of internal rollers. An

optional plurality of heating elements 132 are in close proximity to the toned image such that the heat causes the toner particles present on the surface to soften. The softened toner particles pass through a film layer formation station 130. Station 130 includes a heated roller (not shown) which is in contact with the softened toner image and a backup pressure roll (not shown) behind intermediate member 110. Filming station 130 spreads the softened toner particles into a thin film so that the small gaps between neighboring toner particles are covered with toner without degradation of the image. The toner flow required is very small to cover the spaces between the toner particles. Ideally, the film forming station should form a film of the desired thickness (about 1 μm) regardless of the local toner coverage. One possible way of achieving this is to make the heated roller self-spaced from the intermediate belt 110 at the desired thickness. One method for achieving this requirement would be to utilize a gravure-type roll for the heated roller (not shown).

At stage B illustrated in Fig. 1, formation of a second color takes place in the same manner as described above. The drum 116 is charged with charging unit 101, and then it is exposed by ROS 120 according to second color image bitmap information. After the electrostatic latent image has been recorded, drum 116 advances the electrostatic latent image to development station 103. Dry developer

material with toner of the second color is supplied by development station 103 to develop the latent image.

The developed image is electrostatically transferred to the intermediate member 110 by an electrical bias voltage between drum 116 and belt 110. (Any residual toner on drum 116 is cleaned by cleaner 104). The developed second color image is superimposed on the previous first color image. Heat from the optional heater 132 softens the toner particles. The softened toner particles on the intermediate member 110 pass through the heated filming station 116, which spreads the softened image into a thin film without degradation of the image.

The process is repeated for the next two colors at stages C and D. A multi-layer film image is formed by superimposing black, yellow, magenta, and cyan toners. The full color advances to transfusing stage E.

At transfuse nip 134 illustrated in Fig. 1, the multi-layer full-color film image is transfused to the recording sheet or paper 126 by the application of heat and pressure between a heated roll 135 behind the intermediate belt 110 and a backup pressure roll 136 behind the recording sheet. Moreover, recording sheet 126 may have a previously transferred toner image present on the back surface thereof as the result of a prior imaging operation, i.e. duplexing. As the recording sheet 126 passes through the transfuse nip 134, the multi-layer toner film adheres to the surface of the recording sheet 126, and due to greater

attractive forces between the paper 126 and toner film, as compared to the attraction between the toner film and the low surface energy surface of the compliant intermediate member 110, the multilayer toner film is transferred to the recording sheet 126 as a full-color image. The transfused image becomes permanent once it advances past the transfuse nip 134 and is allowed to cool below the softening temperature of the toner materials. The cycle for forming another document is initiated following the cleaning of any residual toner from the intermediate belt 110 by cleaner 106.

Of course, for monochrome (black and white) printing only a single station is needed and processor 114 would only provide a monochrome signal.

Now considering the ACD operation, software performing the operation of the flow chart of Fig. 2 is normally in the print driver of PC 105, but can be otherwheres, e.g., in software of scanner 102, or in other software of PC 105. In particular, the optional last step 214 is done at printer 108. This does not appreciately increase the cost of printer 108. In Fig. 2, at step 200 a user selects the PRINT application, e.g., by clicking on a PRINT icon (not shown) on PC 105. Step 202 shows that the print driver software provides an interface between the application and the printer, e.g., provides signals in properly formatted form to image processor 114.

At step 204 the print driver performs ACD, e.g., as shown in U.S. Patent No. 5,533,144, hereby incorporated by reference. Any other software or hardware ACD methods and devices can be used. At decision 206 it is determined if currency and/or other selected image, e.g., negotiable securities such as stocks and bonds, are detected. If no selected image is detected, then step 210 shows that a validation code ("ticket") is added to the video data. The validation code added to the document may use one of several known methods. One method is to keep the validation code separate and distinct from the document data. In this case, it would be necessary for the validation code to be encrypted using methods as known in the art of encryption such that adding validation codes outside the scope of the ACD system in order to print a counterfeit would be non-trivial. Another method is to embed the validation code within the actual digital data of the document using methods known such as in digital watermarking.

At step 212 the print driver sends the video data to printer 108. An image from the video data is printed only if the ticket is present as shown at step 214. It is noted that step 214 is performed in image processor 114, provided such processor has the hardware or software for doing this. However, most current printers do not have this software and will therefore print even if no ticket is present. If YES at decision 206, then the video data or signal is invalidated and/or no ticket is added by the printer driver at step 208. Invalidation of the video signal

by altering the data to be printed is shown by line 216. The altered data causes the printer 108 to not properly print, e.g., print "INVALID", print in only one color etc. Thus, even if a printer does not have optional step 214, a counterfeit will not be printed. If the validation code is not added as shown by line 218, the missing ticket causes printer 108 to not print, preferably not even a partial image is printed. Of course, both invalidating the data and not adding a ticket can both be performed on the same video signal for extra security.

It will be appreciated that in the present invention the ACD software and/or hardware is located at a first location, e.g., a PC, where the ACD cost can be readily absorbed. This first location is separate from the printer, which is at a second location. Since the ACD is not in the printer, the cost of the printer is not increased.

While the present invention has been particularly described with respect to preferred embodiments, it will be understood that the invention is not limited to these particular preferred embodiments, the process steps, the sequence, or the final structures depicted in the drawings. On the contrary, it is intended to cover all alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention defined by the appended claims. In addition, other methods and/or devices may be employed in the method and apparatus of the instant invention as claimed with similar results.